

1. A LC tunable resonator device comprising:
 - a capacitor comprising:
 - a first plate comprising a conductive loaded,
resin-based material comprising conductive materials
5 in a base resin host; and
 - a second plate fixably held nearby but not
contacting said first plate such that said first plate
and said second plate are capacitively coupled; and
 - an inductor comprising a loop of said conductive
10 loaded, resin-based material wherein at least one of said
capacitor and said inductor have a varying value.
- 2.The device according to Claim 1 wherein the ratio, by
weight, of said conductive materials to said resin host is
between about 0.20 and about 0.40.
- 3.The device according to Claim 1 wherein said conductive
materials comprise metal powder.
- 4.The device according to Claim 3 wherein said metal powder
is nickel, copper, or silver.
- 5.The device according to Claim 3 wherein said metal powder
is a non-conductive material with a metal plating.

6.The device according to Claim 5 wherein said metal plating is nickel, copper, silver, or alloys thereof.

7.The device according to Claim 3 wherein said metal powder comprises a diameter of between about 3 μm and about 12 μm .

8. The device according to Claim 1 wherein said conductive materials comprise non-metal powder.

9. The device according to Claim 8 wherein said non-metal powder is carbon, graphite, or an amine-based material.

10.The device according to Claim 1 wherein said conductive materials comprise a combination of metal powder and non-metal powder.

11.The device according to Claim 1 wherein said conductive materials comprise micron conductive fiber.

12.The device according to Claim 11 wherein said micron conductive fiber is nickel plated carbon fiber, stainless steel fiber, copper fiber, silver fiber or combinations thereof.

13.The device according to Claim 11 wherein said micron conductive fiber has a diameter of between about 3 μm and about 12 μm and a length of between about 2 mm and about 14 mm.

14.The device according to Claim 1 wherein said conductive materials comprise a combination of conductive powder and conductive fiber.

15.The device according to Claim 1 further comprising an antenna coupled to said capacitor and said inductor.

16.The device according to Claim 1 wherein said capacitor is variable and wherein said first plate and said second plate are movably related such that an overlap area of said first plate and said second plate can be varied.

17.The device according to Claim 16 wherein said second plate comprises metal.

18.The device according to Claim 16 wherein said second plate comprises said conductive loaded resin-based material.

19.The device according to Claim 16 wherein said first plate and said second plate comprise multiple material planes that are interlaced to increase parallel surfaces therebetween.

20.The device according to Claim 16 wherein one of said first and second plates further comprises a circuit trace on a molded circuit board.

21.The device according to Claim 16 wherein one of said first and second plates further comprises a part of a molded housing for an electrical device.

22.The device according to Claim 1 wherein said inductor is variable and further comprises a core structure located inside said loop wherein said core structure alters the inductance of said loop and wherein said core structure and
5 said loop are held in a movable relationship.

23.The device according to Claim 22 further comprising an electrically insulating layer surrounding said loop.

24. The device according to Claim 23 wherein said electrically insulating layer is a resin-based material.

25. The device according to Claim 22 wherein said core structure comprises conductive loaded resin-based material.

26. The device according to Claim 22 wherein said conductive loaded resin-based material comprises an iron-based conductive load.

27. The device according to Claim 22 wherein said core structure comprises a metal.

28. The device according to Claim 22 wherein said loop comprises multiple turns of said conductive loaded resin-based material.

29. The device according to Claim 1 wherein said inductor is variable and further comprises multiple terminals corresponding to multiple inductance values for said inductor based on selection of said multiple terminals.

30. A LC tunable resonator device comprising:
a capacitor comprising:

a first plate comprising a conductive loaded,
resin-based material comprising conductive materials
5 in a base resin host; and
a second plate fixably held nearby but not
contacting said first plate such that said first plate
and said second plate are capacitively coupled;
an inductor comprising a loop of said conductive
10 loaded, resin-based material wherein at least one of said
capacitor and said inductor have a varying value; and
an antenna coupled to said capacitor and said
inductor.

31.The device according to Claim 30 wherein the ratio, by
weight, of said conductive materials to said resin host is
between about 0.20 and about 0.40.

32.The device according to Claim 30 wherein said conductive
materials comprise metal powder.

33.The device according to Claim 33 wherein said metal
powder is a non-conductive material with a metal plating.

34. The device according to Claim 30 wherein said
conductive materials comprise non-metal powder.

35.The device according to Claim 30 wherein said conductive materials comprise a combination of metal powder and non-metal powder.

36.The device according to Claim 30 wherein said conductive materials comprise micron conductive fiber.

37.The device according to Claim 30 wherein said conductive materials comprise a combination of conductive powder and conductive fiber.

38.The device according to Claim 30 wherein said capacitor is variable and wherein said first plate and said second plate are movably related such that an overlap area of said first plate and said second plate can be varied.

39.The device according to Claim 38 wherein said second plate comprises metal.

40.The device according to Claim 38 wherein said second plate comprises said conductive loaded resin-based material.

41.The device according to Claim 38 wherein said first plate and said second plate comprise multiple material planes that are interlaced to increase parallel surfaces therebetween.

42.The device according to Claim 38 wherein one of said first and second plates further comprises a circuit trace on a molded circuit board.

43.The device according to Claim 38 wherein one of said first and second plates further comprises a part of a molded housing for an electrical device.

44.The device according to Claim 30 wherein said inductor is variable and further comprises a core structure located inside said loop wherein said core structure alters the inductance of said loop and wherein said core structure and
5 said loop are held in a movable relationship.

45.The device according to Claim 44 further comprising an electrically insulating layer surrounding said loop.

46. The device according to Claim 45 wherein said electrically insulating layer is a resin-based material.

47. The device according to Claim 44 wherein said core structure comprises conductive loaded resin-based material.

48. The device according to Claim 44 wherein said conductive loaded resin-based material comprises an iron-based conductive load.

49. The device according to Claim 44 wherein said core structure comprises a metal.

50. The device according to Claim 44 wherein said loop comprises multiple turns of said conductive loaded resin-based material.

51. The device according to Claim 30 wherein said inductor is variable and further comprises multiple terminals corresponding to multiple inductance values for said inductor based on selection of said multiple terminals.

52. A method to form a LC resonator device, said method comprising:

providing a conductive loaded, resin-based material comprising conductive materials in a resin-based host; and

5 molding said conductive loaded, resin-based material
into said device.

53.The method according to Claim 52 wherein the ratio, by weight, of said conductive materials to said resin host is between about 0.20 and about 0.40.

54.The method according to Claim 52 wherein the conductive materials comprise a conductive powder.

55.The method according to Claim 52 wherein said conductive materials comprise a micron conductive fiber.

56.The method according to Claim 52 wherein said conductive materials comprise a combination of conductive powder and conductive fiber.

57.The method according to Claim 52 wherein said molding comprises:

 injecting said conductive loaded, resin-based material
into a mold;

5 curing said conductive loaded, resin-based material;
and

 removing said device from said mold.

58. The method according to Claim 57 further comprising forming a dielectric layer over said device.

59. The method according to Claim 58 wherein said step of forming a dielectric layer comprises over-molding.

60. The method according to Claim 58 wherein said step of forming a dielectric layer comprises dipping, spraying, or coating.

61. The method according to Claim 57 further comprising forming a dielectric layer prior to said step of injecting said conductive loaded, resin-based material into a mold wherein said device is over-molded onto said dielectric layer.

62. The method according to Claim 52 wherein said molding comprises:

loading said conductive loaded, resin-based material into a chamber;

extruding said conductive loaded, resin-based material out of said chamber through a shaping outlet; and

curing said conductive loaded, resin-based material to form said device.

63. The method according to Claim 62 further comprising stamping or milling said molded conductive loaded, resin-based material.

64. The method according to Claim 62 further comprising forming a dielectric layer over said device.

65. The method according to Claim 64 wherein said step of forming a dielectric layer comprises extrusion.

66. The method according to Claim 62 wherein said step of forming a dielectric layer comprises dipping, spraying, or coating.